

# Fiber and Telecommunications

## Executive Summary

As the internet and "being connected" became increasingly important to governmental agencies, businesses and residents, Chelan County PUD ("Chelan PUD") invested in and built a fiber broadband system that connects much of Chelan County to the rest of the region, nation, and world. In 2012, the Chelan PUD Board of Commissioners adopted a Strategic Plan that put further broadband system build-out on hold pending improvement in the financial sustainability of the broadband system business model. The Board of Commissioners is now in the process of identifying the next opportunities for growth, but under a sustainable business model.

Chelan PUD operates a Fiber to the Home (FTTH) network using Passive Optical Network (PON) technology. Chelan PUD has much better broadband access than nearly all other rural counties in the country. The existing system passes approximately 69% of the premises served by Chelan PUD's primary electrical system in Chelan County. As a Washington public utility district, Chelan PUD is restricted from supplying retail telecommunications services and facilities to end users. Therefore, its business model is wholesale. The broadband system is "open access"—with multiple retail service providers licensing access and transport services from Chelan PUD, then providing retail services to their end-user customers. These service providers are Chelan PUD's "customers" for purposes of telecommunications authority.

"Fiber" refers to a fiber-optic communications network that converts electronic signals for internet, telephone and television into light and sends them over glass strands that are less than the width of a human hair. With the unsurpassed speed (bandwidth) of fiber, end users can get internet speeds up to 1 Gbps (1,000 Mbps) over Chelan PUD's fiber network. Fiber offers unmatched speed and quality compared to other types of networks, such as twisted copper (DSL) or coax cable (cable internet). By 2016, video is expected to comprise 86% of internet traffic. This trend is a major factor in the growing demand for more bandwidth by end users.

However, the fiber technology Chelan PUD deploys to provide this bandwidth is expensive and is generally more expensive to make available to remote, outlying areas of the county. Areas of Chelan County without fiber services, or with limited service options, could potentially be served with alternative technologies (such as wireless), but there are practical limitations to these options as well.

The Fiber and Telecommunications Topic Team (FTTT) was chartered to explore a full range of options for doing more or less with fiber and presenting options to the Strategic Partners and our customers for the future of the fiber program.

To arrive at an ultimate recommendation, the FTTT considered input from our customers, risk factors, statutory limits, costs, and other factors. The FTTT also relied on the expertise of staff to provide information, analysis and clarifications. The FTTT reviewed seven options:

1. Sell the system
2. Status Quo – continue with current build-out program
3. Five-year build-out to all customers on the primary Chelan PUD electrical system

4. 10-year build out to all customers on the primary Chelan PUD electrical system
5. 11-year limited build-out excluding high “zonal” risk factor areas
6. 11-year limited build-out excluding high and **some** medium “zonal” risk factor areas
7. 11-year limited build-out excluding high and medium “zonal” risk factor areas

Over the course of three months and three meetings, the FTTT developed a recommendation intended to fulfill the planning goal to “do the best, for the most, for the longest” within Chelan PUD’s statutory authority. The process for arriving at this recommendation, and the alternatives considered, are described in the “FTTT Evaluation Process” and “FTTT Recommendation and Options Considered” sections of this report. The FTTT recommendation is summarized below.

**Table 1, Fiber and Telecommunications Topic Team Recommendation**

<b>FTTT Recommendation</b>	
Limited build-out Option 6: excludes the high and some medium zonal risk ranking areas.	This limited build-out the fiber broadband system to areas represents a balance between costs and risks while also providing fiber backbone capability for potential wireless service to adjacent unbuilt areas. This series of projects would be completed in 11 years with planning occurring through 2016 and construction beginning in 2017 or later. Zones served by this recommendation are highlighted in <i>Attachment A, Scenario 3(a)</i> . Total capital cost is estimated at \$25 million. In addition, the FTTT noted that the PUD should continue to consider and plan for alternative technologies such as wireless technologies for the higher risk, harder to serve areas.

## The Fiber Optics and Telecommunications Topic Team – Charter and Special Considerations

Chelan PUD first used fiber optics for internal telecommunications upgrades. For example, in 1999, the utility used fiber optics to interconnect the Wenatchee Headquarters Building to the Rocky Reach Dam, the Rock Island Dam, and several Wenatchee substations. Because the fiber-optic system backbone had excess capacity for other uses, Chelan PUD began exploring build-out opportunities beyond the core fiber backbone. Today, Chelan PUD operates a fiber broadband system including Fiber to the Home (FTTH) network using Passive Optical Network (PON) technology.

The Fiber and Telecommunications Topic Team (FTTT) was chartered to focus on Chelan PUD’s Fiber to the Home (FTTH) network with a basic directive to explore a full range of options for doing more or less with fiber and to make recommendations to the Strategy Partners and public and ultimately to the Board of Commissioners.

Under RCW 54.16.330 and 340, public utility districts in Washington State are authorized to provide wholesale telecommunications services and infrastructure, but not retail services. This means that Chelan PUD cannot provide telecommunications services to end users. The fiber network is “open access” with retail service providers licensing access and transport from the Chelan PUD wholesale system, and then provide retail services to their end-user customers. There are several retail service providers utilizing Chelan PUD’s FTTH network in Chelan County, but the vast majority – over 97% - of retail end users served over Chelan PUD’s network are served by a single provider. The FTTT identified this as a key risk for the program.

The charter of the FTTT was challenging because scenarios for future growth needed to fit into the current wholesale model. The FTTT operated under the assumption that Chelan PUD would not receive statutory authority to provide retail services. Meanwhile, the FTTT recognized that the status quo – i.e., building out the fiber system only on request in accordance with line extension policies – would result in little growth of the system while doing nothing to prevent financial losses over time. In addition, the FTTT determined that the system should not be sold due to Chelan PUD’s inability to decouple its utility controls and communications from the rest of the system.

### FTTT Evaluation Process

Despite these challenges, the FTTT agreed that Chelan PUD’s fiber system provides great value to the county and must remain viable. The FTTT was comprised of members of the public and Chelan PUD staff. It met three times over the course of three months to discuss the challenges and possible opportunities, evaluate customer comments and select a recommendation. Throughout the process, the FTTT also considered the value of and opportunities for improving the existing fiber system, as shown in Table 3.

**Table 3: Value of and Opportunities for Improving the Existing Fiber System**

<b>FTTT Evaluation of Chelan PUD’s Existing Fiber Optics System</b>	
<b>Value of the Fiber System</b>	<b>Opportunities for Improvement</b>
Adds to the quality of life in Chelan County (i.e. telecommuting, home entertainment)	Service providers could provide a higher level of service (particularly around new service installations)

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Contributes to the county’s economic vitality. The availability of broadband services over fiber are attractive to business considering the area; improve the educational systems; enable health systems and contribute to the economic development of the county.	Overall response time to new service requests needs improvement
Increases property values in areas served. In 2013, it was estimated that FTTH added between \$5,300 and \$6,451 in value to a \$300,000 home <sup>1</sup> .	Risks for customers and Chelan PUD are inherent with one retail provider serving over 97% of end users over Chelan PUD’s FTTH network
Improves K-12 education	Opportunities for investing in alternative technologies for hard-to-serve areas have been missed
Likely drove improvements in other broadband systems (i.e. competitors’ systems)	“Take rates” are low at about 40% of potential customers taking service
Provides healthcare benefits	Lack of marketing contributes to low take-rates
Enables better business practices (commerce, better services to customers, ability to serve customers anywhere)	Late to deploy fiber in some areas, lost opportunity to competitors
Provides broadband to areas that would otherwise not have service	

Chelan PUD customers and employees submitted 117 comments on the future of the fiber system, ranging from expansion of the system to improvements to existing assets and services<sup>2</sup>. Chelan PUD staff categorized these comments as follows:

- Build-out the system 81 comments – 70%
- General fiber system comments 11 comments – 10%
- Improve current services 14 comments – 12%
- Maintain the status quo 6 comments – 5%
- Provide Wi-Fi hotspots 3 comments – 3%
- Get out of the telecom business 2 comments – 2%

Although the comments about building out the system collectively comprised 70% of all comments, varying degrees of build-out were suggested, ranging from complete the build-out to the entire county to using alternative technologies to serve areas that are more difficult and costly to serve.

Utilizing parameters from the FTTT, Chelan PUD staff developed five options for the future of the fiber optics system. Two additional options, "sell the system" and "continue with the status-quo", were eliminated from further analysis. Selling the system was deemed impractical due to the inability for the District to separate the District’s critical infrastructure from the components used to provide wholesale services. The status quo path results in minimal growth of the system and the potential for high churn rates as customers move into and around the county in areas where the District system is not established and was thus also deemed impractical. Overall, there was a strong sense that some level of fiber system is appropriate, with a preference that build-out should not be delayed too long.

<sup>1</sup> RVA LLC presentation to the FTTH 2013 Conference & Expo.

<sup>2</sup> 62% of the comments were from customers, 27% from employees and 11% did not identify themselves.

Five other options prepared by Chelan PUD staff were analyzed. These considered two basic approaches: full build-out of the fiber system and limited build-out<sup>3</sup>. Full build-out is defined as reaching the majority of the primary electrical system as represented by meter counts, excluding, but not limited to, Stehekin, Holden Village and the McNeil Canyon area in Douglas County (currently served by Chelan PUD). Limited build-out excludes certain zones based on a risk assessment (referred to as zonal risk) as well as staff expertise and field knowledge.

All scenarios are based on financial, geographic, technological and physical assumptions spanning multiple years. For the purposes of this analysis, staff developed funding zones based on combinations of Fiber Distribution Towers (FDT) serving defined areas. The FTTT based their recommendation on cost and condition assumptions based on these defined funding zones. Chelan PUD staff provided five options for FTTT consideration, using the following assumptions:

1. The capital investment required for any fiber network build-out is funded by Chelan PUD "public power benefits";
2. Fiber system build-out zones are required to cover operating and maintenance costs with revenues based on the current 40% average take-rate;
3. All analysis was based on preliminary engineering estimates – not detailed design parameters. The estimates for the options include two major cost components:
  - a. Fiber infrastructure to support the number of premises passed
  - b. Fiber drop and device costs based on 40% take rate
4. New financial planning financial targets will need to be established:
  - a. Reduce required cash reserves to \$1 million; and
  - b. Eliminate rate of return target;
5. Chelan PUD financial policies will need to be changed to allow for build-out;
6. If financial reserves cannot cover any unforeseen emergencies, such as a major storm, the cost would have to be covered by other than the fiber wholesale system rates (i.e., net surplus energy sales);
7. Build-out is based on the Chelan PUD primary electrical system footprint and build-out of the current fiber footprint;
8. For limited build-out options, some fiber backbone capability would be provided for potential wireless solutions to service adjacent unbuilt areas;
9. Collocation in the electrical conduit will be practiced where available.

As shown in Attachments A, B, and C, groups of geographical FDT zones (grouping of up to 288 end users) are shown as potential "Funding Zones" within build-out areas. These Funding Zones represent service areas based on the existing electrical infrastructure and node capacity. There are 41 Funding Zones, each with varying degrees of difficulty for construction and maintenance requirements.

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<sup>3</sup> For purposes of this report, build-out refers to expanding the system and/or extending the system. Expansion includes deployment to zones outside the current service area where customers do not have fiber available and requires new distribution and or backbone fiber optic cable, new Fiber Distribution Towers (FDT), possible construction of a new node and drops with termination equipment on each premise that subscribes. Extension includes deployment to unserved areas that are within the current service area

All costing was based on preliminary engineering estimates – not detailed design parameters. As such, the actual costs will vary by construction conditions and market pricing of materials at the time of construction.

Each Funding Zone was also given a zonal risk ranking by Chelan PUD staff. The objective in developing the zonal risk rankings was to apply the assumptions in a fair and standardized manner. Eight risk factors were weighted in the following manner to determine the zonal risk rankings:

1. Physical constructability (5%)
2. Pole replacement potential (quantity) (10%)
3. Permitting difficulty (20%)
4. Maintenance difficulty (20%)
5. Seasonality of residences (10%)
6. Competing technology availability (10%)
7. Low potential take rate (10%)
8. Density of residences (15%)

Scores of 1-3 (1 being “lower zonal risk”, 3 being “zonal higher risk”) were assigned to each funding zone, weighted, and given an overall calculation. These scores are shown for each Funding Zone in Attachments B, and C.

General programmatic risks are essentially the same across all scenarios, including lower than expected take-rates, higher than expected costs, stranded investment due to changing technologies, possible shift in public support, and changing state and federal laws and regulations. A key programmatic risk to further investment in the fiber system is the potential of stranded assets due to a potential future loss of the county's primary retail service provider. The FTTT did not evaluate potential mitigation strategies for these risks, as they are tied to Chelan PUD’s existing statutory authority to provide wholesale, not retail authority.

Based on all the input, the FTTT determined that the most sustainable approach to building-out Chelan PUD’s broadband system would begin with the areas with the best potential for return on the investment. In other words, it makes sense to first “back-fill” any gaps in coverage within existing service areas.

## **FTTT Recommendation and Options Considered**

The FTTT reviewed seven options for the fiber system. The first and second options were quickly eliminated from further consideration. Subsequent discussion centered around bringing fiber to the entire county with a philosophy of serving the customers in remote areas first, producing the following options:

- Option 3 – 5 Year, \$63M, 40% take rate, approximately 100% premises passed
- Option 4 – 10 Year, \$63M, 40% take rate, approximately 100% premises passed

Recognizing the magnitude of the funding requirements, the FTTT proposed options that considered financial and risk impacts. These options include:

- Option 5 – 11 Year, \$41M, 40% take rate, approximately 95% premises passed
- Option 6 – 11 Year, \$25M, 40% take rate, approximately 87% premises passed

- Option 7 – 11 Year, \$15M, 40% take rate, approximately 80% premises passed

After evaluating the options, the FTTT recommended the limited build-out Option 6, estimated at \$25 million for further consideration by the Strategic Partners and the public. This option would increase “premises passed” to approximately 87% of the county over the next 11 years. This scenario was recommended due to fiscal constraints and the need to maintain a sustainable system. The team also recommended that Chelan PUD continue to research viable alternative technologies to deliver a reasonable level of service to areas outside the fiber zones.

**Recommended Option 6 - 11 year build-out with estimated cost of \$25 million.**

Build-out the fiber system over 11 years excluding high and **some** medium zonal risk factor areas. This option would pass approximately 87% percent of county premises on the primary electric distribution system and cost an estimated \$25 million.

**Discussion of Relevant Factors**

This scenario includes build-out of the fiber system over 11 years to customers, excluding high and some medium zonal risk factor areas. Remote communities and developments not served by the primary electric distribution system, such as Stehekin, Holden Village and the McNeil Canyon area in Douglas County are excluded. Planning would occur through 2016 and construction beginning in 2017. The build-out contemplated in this option also provides adequate infrastructure to support alternative technologies and further build-out of the system if it determined feasible in the future. The build-out in this option is See *Attachment A, 11-Year, High, Medium and Low Cost Deployment Scenarios, Staff Scenario #3(a): Medium*, details how the build-out would proceed to various areas of the county. Based on assumptions made, the projected capital cost of this option is \$25 million. Revenue from this option is intended to cover the related ongoing operations and maintenance cost.

**Strategic Planning  
Valuation Criteria**

	Direct Impacts					Indirect Impacts						
	Financial Impact	Customer Equity	PUD Authority	Workforce Capability	Jobs	Economic Impact	Recreation	Health	Education	Community	Environment	
	1	3	5	2	3	1	1	2	2	1	-1	

In addition to the recommendation, the FTTT members felt strongly that alternative options must be considered and used where viable to serve the "harder to serve areas." The FTTT requested that Chelan PUD include an annual budget line item for research and development (not included in the estimated capital cost). FTTT members also emphasized the need for Chelan PUD to improve our processes for connecting new customers, raise customer awareness of the benefits of the fiber system, and improve the overall service levels of the offerings. In general, FTTT members agreed it was particularly important for Chelan PUD to commit to a plan and maintain momentum without “stop and go” slowdowns during the implementation phase.

The FTTT also considered, but rejected, the following alternative scenarios.

**Alternative Scenario Description 5 - 11-year build-out with estimated cost of \$41 million**

Build-out the fiber system excluding highest zonal risk factor customers. This option would increase premises passed to approximately 95% of county premises on the primary electric distribution system and cost an estimated \$41 million.

**Discussion of Relevant Factors**

This scenario includes build-out of the fiber system to pass 95% of the premises on the primary electrical distribution system, excluding highest zonal risk factor areas. Remote communities and developments not served by the primary electric distribution system, such as Stehekin, Holden Village and the McNeil Canyon area in Douglas County are excluded. This effort would be completed in 11 years, with planning occurring through 2016 and construction beginning in 2017. *Attachment A, 11-Year, High, Medium and Low Cost Deployment Scenarios Staff Scenario #3: High* details how the build-out would proceed. The projected capital cost of this option is \$41 million. Revenue from this scenario is intended to cover the related ongoing operations and maintenance cost.

**Strategic Planning  
Valuation Criteria**

	Direct Impacts					Indirect Impacts						
	Financial Impact	Customer Equity	PUD Authority	Workforce Capability	Jobs	Economic Impact	Recreation	Health	Education	Community	Environment	
	1	3	5	2	3	1	1	2	2	1	-1	

**Alternative Scenario Description 7 - 11-year build-out with an estimated cost of \$15 million**

Build-out the fiber system excluding high and medium zonal risk factor customers. This option would increase premises passed to approximately 80% of county premises on the primary electric distribution system and cost an estimated \$15 million.

**Discussion of Relevant Factors**

This scenario includes build-out of the fiber system excluding high and medium zonal risk factor areas. Remote communities and developments not served by the primary electric distribution system, such as Stehekin, Holden Village and the McNeil Canyon area in Douglas County are excluded. This effort would be completed in 11 years, with planning occurring through 2016 and construction beginning in 2017. *Attachment A, 11-Year, High, Medium and Low Cost Deployment Scenarios, Staff Scenario #3(b): Low* below details how the build-out would proceed. The estimated capital cost of this scenario is \$15



million. Revenue from this option is intended to cover the related ongoing operations and maintenance cost.

Strategic Planning Valuation Criteria	Direct Impacts						Indirect Impacts					
	Financial Impact	Customer Equity	PUD Authority	Workforce Capability	Jobs	Economic Impact	Recreation	Health	Education	Community	Environment	
	1	2	5	3	3	1	1	2	2	1	-1	

**Alternative Scenario Description 4 – 10-year build-out an estimated cost of \$63 million**

Build-out to pass all customers on the primary electric system in a ten-year period. This option would increase premises passed to all county premises on the primary electric distribution system and cost an estimated \$63 million.

**Discussion of Relevant Factors**

This scenario includes build-out of the fiber system to all customers on the primary electric system in a 10-year period. Remote communities and developments not served by the primary electric distribution system, such as Stehekin, Holden Village and the McNeil Canyon area in Douglas County are excluded. This effort would be completed in 10 years, with planning occurring through 2016 and construction beginning in 2017. All currently metered customers would have access to the fiber network. See *Attachment B – 10-Year, High Cost Scenario* for how the 10-year build-out would proceed. The estimated capital cost of this scenario is \$63 million. Revenue from this option is intended to cover the related ongoing operations and maintenance cost. The 10-year build-out would be completed in 2027.

Strategic Planning Valuation Criteria	Direct Impacts						Indirect Impacts					
	Financial Impact	Customer Equity	PUD Authority	Workforce Capability	Jobs	Economic Impact	Recreation	Health	Education	Community	Environment	
	1	3	4	2	3	1	1	2	2	1	-1	

**Alternative Scenario Description 3 – Five-year**

Build-out to pass all customers on the primary electric system in a five-year period. This alternative would increase premises passed to all county premises on the primary electric distribution system and cost an estimated \$63 million.

**Discussion of Relevant Factors**

This scenario includes build-out of the fiber system to all customers on the primary electric system in a five-year period. Remote communities and developments not served by the primary electric distribution system, such as Stehekin, Holden Village and the McNeil Canyon area in Douglas County are excluded. This effort would be completed in five years, with planning occurring through 2016 and construction beginning in 2017. All currently metered customers would have access to the fiber network. See Attachment C, *Five-year, High-Cost Scenario* for how the 5-year build-out would proceed. The capital cost only will be \$63 million. Revenue from this option is intended to cover the related ongoing operations and maintenance cost. The five-year build-out would be completed in 2021

**Strategic Planning  
Valuation Criteria**

	Primary Impacts					Secondary Impacts					
	Financial Impact	Customer Equity	PUD Authority	Workforce Capability	Jobs	Economic Impact	Recreation	Health	Education	Community	Environment
	1	3	4	1	3	1	1	2	2	1	-1

**Alternative Scenario Description 1 - Sell the System**

This alternative is to sell the entire fiber optic system currently used to provide wholesale services, to an independent company. The District would need to retain the components of the system used by the District for its communications, monitoring and control – all considered critical infrastructure.

**Discussion of Relevant Factors**

No evaluation was performed as this option was taken off the table early in the process since it was determine to be impractical due to the inability for the District to separate the District’s critical infrastructure from the components used to provide wholesale services.

**Alternative Scenario Description 2 – Status Quo: Continue with Current Program**

This alternative is to follow the current build-out path based on the 2012 policies. This path results in minimal growth of the system and the potential for high churn rates as customers move into and around the county in areas where the District system is not established.

**Discussion of Relevant Factors**

No evaluation was performed as this option was taken off the table early in the process since it did not result in appreciable growth of the system and would result in increased financial losses by 2028.

**Conclusion**

The Fiber and Telecommunications Topic Team’s charter was to evaluate Chelan PUD’s fiber network and make a recommendation about whether Chelan PUD should maintain the status quo, expand the system to all Chelan County residents, or some point in between. The existing system passes approximately 69% of the premises in Chelan County that are served by the primary electric distribution system. Seven scenarios ranged from selling the system to full build-out were considered. Two options were dismissed early in the process. First, the team determined that the fiber system should not be sold due to Chelan PUD’s inability to decouple its utility controls and communications from the rest of the system. Second, the team agreed that maintaining the status quo – i.e., building out the fiber system only on request in accordance with line extension policies – would result in little growth of the system while doing nothing to prevent financial losses over time.

The five remaining scenarios for expansion, which would involve utilizing funding from a potential “public power benefit” were then evaluated. Two considered full build-out over either five or 10 years and three explored build-outs that are more limited. All build out option costs are estimates and based upon the assumptions set forth in the report. The full build-out options would cost approximately \$63 million and pass all premises on the primary electrical system. The limited build-out options were evaluated in terms of risk and ongoing cost of operation. These would cost approximately \$41 million, \$25 million or \$15 million and would pass approximately 95%, 87% and 80% respectively of the premises on the primary electrical system. All options excluded Stehekin, Holden Village and the McNeil Canyon area in Douglas County which are not on the primary electrical system.

Ultimately, the team recommended the limited build-out option estimated at \$25 million for further consideration by the Strategic Partners and the public. This option would increase “premises passed” to approximately 87% of the county over the next 11 years. This scenario was recommended due to fiscal constraints and the need to maintain a sustainable system. The team also recommended that Chelan PUD continue to research viable alternative technologies to deliver a reasonable level of service to areas outside the fiber zones.

**Contact Information**

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**Attachment A - 11-Year, High, Medium and Low Cost Deployment Scenarios**

<b>Staff Scenario #3: High (Option # 5)</b>	<b>Staff Scenario #3(a): Medium (Option # 6)</b>	<b>Staff Scenario #3(b): Low (Option # 7)</b>
College	College	College
Manson	Manson	Manson
Saddlerock	Saddlerock	Saddlerock
Wenatchee	Wenatchee	Wenatchee
Western	Western	Western
Brender Canyon	Brender Canyon	Brender Canyon
Cashmere	Cashmere	Cashmere
Malaga	Malaga	Malaga
Mission Creek	Mission Creek	Mission Creek
Sunnyslope	Sunnyslope	Sunnyslope
Yaksum Canyon	Yaksum Canyon	Yaksum Canyon
Columbia River Corridor	Columbia River Corridor	Columbia River Corridor
Entiat	Entiat	Entiat
Entiat Valley	Entiat Valley	Entiat Valley
Navarre Coulee	Navarre Coulee	Navarre Coulee
Squilchuck	Squilchuck	Squilchuck
Chelan	Chelan	Chelan
Chelan South Shore	Chelan South Shore	Chelan South Shore
Monitor	Monitor	Monitor
Nahahum Canyon	Nahahum Canyon	Nahahum Canyon
North Dryden Rd	North Dryden Rd	North Dryden Rd
Olalla Canyon	Olalla Canyon	Olalla Canyon
Stine Hill Road	Stine Hill Road	Stine Hill Road
Boyd Rd	Boyd Rd	Boyd Rd
Cooper Gulch	Cooper Gulch	Cooper Gulch
Manson	Manson	Manson
Wapato	Wapato	Wapato
Blewett Pass	Blewett Pass	Blewett Pass
Leavenworth	Leavenworth	Leavenworth
Mountain Home	Mountain Home	Mountain Home
Chumstick	Chumstick	Chumstick
Eagle Creek	Eagle Creek	Eagle Creek
Merry Canyon	Merry Canyon	Merry Canyon
Lake Wenatchee	Lake Wenatchee	Lake Wenatchee
Plain	Plain	Plain
Ponderosa	Ponderosa	Ponderosa
Azwell	Azwell	Azwell
Union Valley	Union Valley	Union Valley
Stevens Pass	Stevens Pass	Stevens Pass
Winton	Winton	Winton
Colockum	Colockum	Colockum
White River	White River	White River
<b>\$ 40,662,808</b>	<b>\$ 25,076,572</b>	<b>\$ 15,280,875</b>

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**Attachment B –10-Year, High Cost Scenario**

<b>Funding Zones</b>	<b>Year</b>	<b>Risk Ranking</b>	<b>Connections @ 40%</b>	<b>Payback</b>	<b>Capital Costs</b>	<b>Revenue Per Year</b>
Boyd Rd	2017	1.6	57	40	935,575	23,174
Colockum	2017	2.3	20	57	473,364	8,323
Union Valley	2017	1.6	59	135	2,957,405	23,990
Cooper Gulch	2017	1.6	74	47	1,419,392	30,192
Entiat Valley	2018	1.8	164	38	2,594,259	66,912
Navarre Coulee	2018	2.2	75	71	2,150,770	30,682
Columbia River Corridor	2018	2.2	81	17	575,689	33,130
Azwell	2018	1.6	175	47	3,093,928	71,318
White River	2019	2.6	19	154	1,209,304	7,834
Stevens Pass	2019	2.4	108	61	2,347,400	44,227
Plain	2019	1.7	231	21	2,188,532	94,166
Winton	2019	2.6	17	306	2,098,910	6,854
Merry Canyon	2020	1.8	74	24	739,605	30,192
Olalla Canyon	2020	2.0	88	83	2,950,601	35,741
Eagle Creek	2020	1.8	78	30	948,786	31,824
Mountain Home	2020	2.5	85	33	1,127,639	34,598
Mission Creek	2021	1.7	92	12	436,368	37,699
Nahahum Canyon	2021	1.9	93	46	1,759,117	38,026
Yaksum Canyon	2021	1.7	67	14	373,950	27,254
Cashmere	2021	1.5	356	15	2,088,016	145,248
Chelan	2022	2.4	314	19	3,289,956	128,275
Chelan South Shore	2022	2.1	373	16	2,435,178	152,266
Manson	2022	1.8	522	17	3,535,787	210,038
Stine Hill Road	2023	1.6	105	13	544,030	42,758
Entiat	2023	1.7	103	14	468,491	42,106
Wapato	2023	1.7	149	34	2,048,378	60,874
Chumstick	2023	1.9	85	14	473,993	34,762
Lake Wenatchee	2023	2.4	47	108	2,081,422	19,258
Ponderosa	2024	1.8	18	22	158,686	7,344
North Dryden Rd	2024	1.6	55	25	558,477	22,358
Brender Canyon	2024	1.7	74	17	504,588	30,192
Blewett Pass	2024	2.2	196	19	1,465,524	79,805
Leavenworth	2024	2.2	129	22	1,378,385	52,714
Saddlerock	2025	1.9	306	19	3,521,204	124,848
Western	2025	1.9	240	16	2,125,502	97,757
Wenatchee	2025	1.9	184	14	1,069,470	72,950
College	2025	1.9	130	15	816,830	53,203
Monitor	2026	1.6	142	20	1,134,302	57,773
Squilchuck	2026	1.7	44	16	306,266	17,952
Sunnyslope	2026	1.6	103	17	767,105	42,106
Malaga	2026	1.7	161	33	2,042,581	65,606
<b>Grand Total</b>			<b>5494</b>		<b>63,194,765</b>	

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**Attachment C –Five-Year, High-Cost Scenario**

<b>Funding Zones</b>	<b>Year</b>	<b>Risk Ranking</b>	<b>Connections @ 40%</b>	<b>Payback</b>	<b>Capital Costs</b>	<b>Revenue Per Year</b>
Columbia River Corridor	2017	2.2	81	17	575,689	33,130
Cooper Gulch	2017	1.6	74	47	1,419,392	30,192
Boyd Rd	2017	1.6	57	40	935,575	23,174
Entiat Valley	2017	1.8	164	38	2,594,259	66,912
Union Valley	2017	1.6	59	135	2,957,405	23,990
Azwell	2017	1.6	175	47	3,093,928	71,318
Colockum	2017	2.3	20	57	473,364	8,323
Navarre Coulee	2017	2.2	75	71	2,150,770	30,682
Merry Canyon	2018	1.8	74	24	739,605	30,192
Plain	2018	1.7	231	21	2,188,532	94,166
Mountain Home	2018	2.5	85	33	1,127,639	34,598
Stevens Pass	2018	2.4	108	61	2,347,400	44,227
Olalla Canyon	2018	2.0	88	83	2,950,601	35,741
Eagle Creek	2018	1.8	78	30	948,786	31,824
Winton	2018	2.6	17	306	2,098,910	6,854
White River	2018	2.6	19	154	1,209,304	7,834
Mission Creek	2019	1.7	92	12	436,368	37,699
Nahahum Canyon	2019	1.9	93	46	1,759,117	38,026
Cashmere	2019	1.5	356	15	2,088,016	145,248
Yaksum Canyon	2019	1.7	67	14	373,950	27,254
Chelan South Shore	2019	2.1	373	16	2,435,178	152,266
Chelan	2019	2.4	314	19	3,289,956	128,275
Manson	2019	1.8	522	17	3,535,787	210,038
Ponderosa	2020	1.8	18	22	158,686	7,344
Stine Hill Road	2020	1.6	105	13	544,030	42,758
Brender Canyon	2020	1.7	74	17	504,588	30,192
Blewett Pass	2020	2.2	196	19	1,465,524	79,805
Chumstick	2020	1.9	85	14	473,993	34,762
Wapato	2020	1.7	149	34	2,048,378	60,874
North Dryden Rd	2020	1.6	55	25	558,477	22,358
Lake Wenatchee	2020	2.4	47	108	2,081,422	19,258
Entiat	2020	1.7	103	14	468,491	42,106
Leavenworth	2020	2.2	129	22	1,378,385	52,714
Sunnyslope	2021	1.6	103	17	767,105	42,106
Western	2021	1.9	240	16	2,125,502	97,757
Saddlerock	2021	1.9	306	19	3,521,204	124,848
Monitor	2021	1.6	142	20	1,134,302	57,773
Wenatchee	2021	1.9	184	14	1,069,470	72,950
Malaga	2021	1.7	161	33	2,042,581	65,606
Squilchuck	2021	1.7	44	16	306,266	17,952
College	2021	1.9	130	15	816,830	53,203
<b>Grand Total</b>			<b>5494</b>		<b>63,194,765</b>	